Preconceptional and prenatal exposure to paternal smoking affects semen quality of adult sons

June 25 2019

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The adverse effect of maternal smoking during pregnancy is well established and associated with several negative neonatal outcomes (such as low birth weight and preterm birth). It is also evident in some studies

that the semen quality of men exposed to prenatal maternal smoking is generally more impaired than that of unexposed men. However, there is little known about the effect of paternal smoking in the time leading up to and during pregnancy.

Now, preliminary results from a large population study based on the Danish National Birth Cohort has found that paternal smoking is associated with lower total sperm counts and sperm concentrations independent of maternal smoking and other confounding factors (such as age, alcohol consumption or BMI).

'There have been previous studies investigating the association of paternal smoking with semen quality but these were small studies without information on key confounders,' said investigator Dr. Sandra Søgaard Tøttenborg from Bispebjerg Frederiksberg Hospital, in Copenhagen, Denmark. 'Our larger study does support these previous findings that paternal smoking is associated with sperm concentrations in male offspring independently of maternal smoking. We also found the association was independent of other preconceptional and prenatal risk factors for adult semen quality—including parental age, alcohol and caffeine consumption, pre-pregnancy BMI, and household occupational status.' The results are presented today by Dr. Tøttenborg at the 35th Annual Meeting of ESHRE in Vienna.

The study was a follow-up analysis of 778 19-year-old young men born to mothers registered in the Danish National Birth Cohort between 1996 and 2002. Smoking information (including that on the father) was based on a maternal report around gestational week 16. Semen quality in the young men was analysed according to WHO criteria to include sperm concentration, total sperm count, morphology and sperm motility.

Results showed that in the adjusted analyses the sons of fathers who smoked daily (and where the mothers did not smoke) had a 8% lower

sperm concentration and 9% lower total sperm count than the sons of paternal non-smokers

'Our results did show an association with paternal smoking,' said Dr. Tøttenborg, 'but the effect of maternal smoking is much larger. If the mother but not the father smoked, the reduction was 26% for sperm concentration and 46% for sperm count. It's certainly worse for the boys if the mother smokes. Nevertheless, the circumstances in which the father smokes but the mother doesn't is much more prevalent, so this is still very relevant for public health. A decline in sperm count of 8-9% can seriously affect the fertility of men with already sub-optimal sperm quality.'

Dr. Tøttenborg added that, while the association with sperm count and concentration observed in this study is not dramatic when compared to other known risk factors (such as exposure to certain pesticides and some urogenital disorders such as cryptorchidism), it still remains in the same range as that associated with smoking in the adult man.

The likely explanation for a preconceptional or prenatal effect of paternal smoking in the offspring is epigenetic, by which paternal smoking can induce alterations in the sperm genome which in turn may be transmitted to the cells of the offspring.

More information: Abstract O-179, Tuesday 25 June 2019: Prenatal exposure to paternal smoking and semen quality in the adult offspring.

Provided by European Society of Human Reproduction and Embryology

https://medicalxpress.com/news/2019-06-preconceptional-prenatal-exposure-paternal-affects.html